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Research Article

ANTI-INFLAMMATORY AND ANTIBACTERIAL ACTIVITY OF JATROPHA CURCAS LINN.

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ABSTRACT

Jatropha curcas Linn., a Bio-diesel plant known for various medicinal uses in folklore has been evaluated for few pharmacological aspects. The plant is being collected, dried and extracted by maceration method with ethanol and water. They were concentrated using vacuum distillation and the extracts were used for the evaluation of anti-inflammatory, analgesic and antibacterial activity using Formalin induced paw edema method, eddy's hot plate method and disc diffusion method respectively. The analgesic and anti-inflammatory activity of bark water extract and leaf water extract was found significant at $P<0.05$ and $P<0.001$ respectively. The maximum analgesic effect was observed at 60min at 300mg/kg (i.p) and was similar to that of standard aspirin (50mg/kg). The edema inhibition effect was 100% for leaf water extract (300mg/kg) after 24hrs and was found effective when compared with standard Ibuprofen (50mg/kg). The antibacterial activity was also found effective at 10mg/ml.

KEY WORDS: anti inflammatory activity, analgesic activity, antibacterial activity, *Jatropha curcas Linn.*

INTRODUCTION

Jatropha curcas Linn.,(1,2) (Euphorbiaceae) is a perennial shrub or tree which grows up to a height of 5m distributed in Brazil, India, Jamaica, Panama, Salvador. The plant is known famous for its bio-diesel[2]. This plant is used traditionally for various ailments like in the treatment of dropsy, Gout, Paralysis, treatment of scabies, eczema, dermatitis, Rheumatic(3,4,5) etc. The presence of Bio-diesel, seed oil and anti microbial activity(6) has also been reported. There fore, the present study was undertaken to evaluate their anti inflammatory and antibacterial activity.

MATERIALS AND METHODS

Plant material

The plant *Jatropha curcas Linn*, was collected from Andhra Pradesh forest academy, Hyderabad & Acharyaranga Univ Hyderabad in December 2008. It was identified and authenticated by Mr. N. Senthilkumar (Scientist, AP Forest Academy Res. Centre, hyd). A voucher specimen was deposited at the Department of pharmacognosy, Malla reddy Institute of Pharmaceutical sciences.

Preparation of extract

The air dried powder material (500gm) was extracted by maceration method(7) with ethanol and water and used for the following study. Each extract was carefully evaporated in a rotary evaporator under controlled temperature and reduced pressure to get the extract. The percentage yield was found to be 5% w/w.

Animals

Albino wistar rats and mice of either sex weighing 150-200gm and 25-30gm were bred and maintained under standard conditions in the central animal house at the college and animal ethical committee clearance was obtained for carrying out the experiment. They were housed in the animal house of the pharmacology department for 7 days for acclimatization in an air conditioned atmosphere at 20°C. Prior to the experiment, all the animals were fasted overnight with water *ad libitum.*

Acute toxicity studies

LD_{50} was carried out on mice of either sex according to the Reed and Meuch Method (8) and the doses were fixed as 300mg/kg. (i.p). The plant has no marked effect on the general behavior of mice at the dose of 300mg/kg but showed a mild depressant effect with the symptoms of auditory and pinna reflex. The depressant effect of JC on CNS was further confirmed by the fact that it had exhibited significant analgesic activity.

Analgesic activity(9)

Animal model which showed reaction time of 3-5sec were selected for screening of analgesic activity. Albino mice of either sex weighing between 25-30gm were selected for the experiment and the analgesic activity was studied using Eddy's hot plate method. Mice were divided into four groups of six each and tested for 4hrs. Group I received CMC and served as control. Group II received 50mg/kg aspirin and served as standard. Group III (received extract I

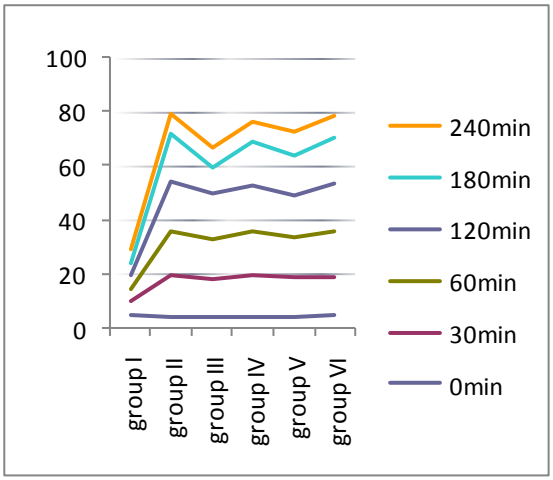
- bark ethanol ext), Group IV (received extract II – bark water ext), Group V (received extract III - leaf ethanol ext) & Group VI (received extract IV - leaf water ext) of Jatropha curcas Linn, at the dose of 300mg/kg (i.p). the observations were made at 30 min intervals up to 4 hrs. The results are shown in Table 1 and graphical representation of the results is indicated in fig 1.

Table 1

Analgesic activity of *Jatropha curcas Linn*, in albino mice (n=6)

Group	Reaction time in seconds					
	0min	30min	60min	120min	180min	240min
Group I	4.83±0.21	5±0.0	4.67±0.23	4.83±0.21	4.83±0.17	4.67±0.3
Group II	4.17±0.17	15.3±0.2	16.6±0.7	17.83±0.65	18.12±0.98	7±0.92
Group III	4.14±0.15	14.17±1.0	15±1.06	15.87±0.79	10.5±0.5	6.66±0.17
Group IV	4.2±0.31	15.6±1.2	16.1±0.1	16.2±0.7	16.7±0.15	7.1±0.76
Group V	4.17±0.17	14.7±0.1	14.9±0.5	15.2±0.2	15.1±0.6	8.1±0.18
Group VI	4.5±0.22	14.5±0.15	17±0.52	17.2±0.63	17.1±0.1	8.2±2.2

Fig – 1 Analgesic activity of Jatropha curcas Linn,



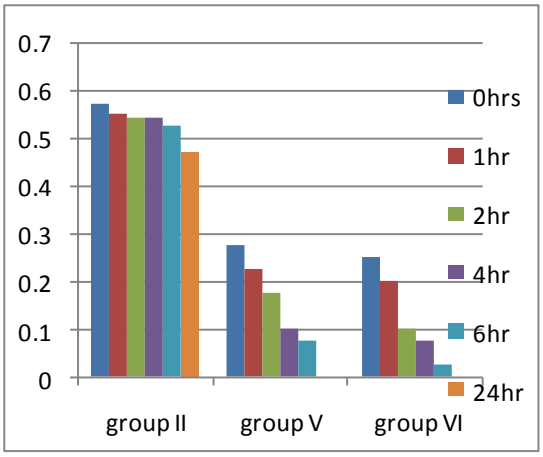
Anti inflammatory activity(10)

Twenty four albino wistar rats of either sex weighing between 150-200gm were divided in to four groups. Group I received CMC and served as control. Group II received Ibuprofen 50mg/kg and served as standard. Group III received extract III and Group IV received extract IV of Jatropha curcas L., as Extract III & IV was found to show good analgesic activity. One hour after the administration 0.1ml of 0.05% of formalin was injected beneath the sub-plantar surface of the right hind paw of all animals. For the assessment of the anti-inflammatory activity, the volume of the paw was measured with the help of mercury plethysmometer at 0hr and at 1hr interval for a period of 24 hrs after the formalin treatment. The results are tabulated in table 2 and represented graphically in fig 2.

Table 2: Anti-inflammatory activity of *Jatropha curcas Linn*, in albino rats (n=6)

Compound	Mean±SE difference in right and left paw volume (ml)						Reduction of edema (%)					
	0hr	1hr	2hr	4hr	6hr	24hr	0h	1h	2h	4h	6h	24h
Group I	18±0.025	24.33±0.025	31.33±0.025	54.16±0.0	62±0.025	55.66±0.0239	-	-	-	-	-	-
Group II	0.575±1.86	0.555±2.34	0.54±4.46	0.54±4.16	0.53±3.27	0.475±3.63	60	62	63	69	67	73
Group V	0.275±0.025	0.225±0.025	0.175±0.025	0.1±0.0	0.075±0.025	0±0	47.5	57.5	71	84	87	100
Group VI	0.25±0.0288	0.2±0.0408	0.1±0.0408	0.075±0.025	0.025±0.025	0±0	52.5	62.5	82	88	96	100

Fig - 2Anti-inflammatory activity of Jatropha curcas L.,



Anti-microbiological activity

Microorganisms

The microorganisms used in this study consisted of 6 bacteria (Bacillus subtilis, E.coli, Pseudomonas aeruginosa, E. aerogenes, and Proteus vulgaris) reference stains obtained from the Dept of Microbiology, Malla Reddy Engineering College, Hyderabad.

All the strains were grown at 37°C and maintained on nutrient agar.

Antibacterial assay(11)

The ethanol and water extracts were dissolved in dimethyl formamide (6%) which was previously tested for antibacterial activity against all test bacteria and found to have no antibacterial activity. The antibacterial activity was determined by disc diffusion method.

Ethanol extract was solubilized in a mixture of dimethyl formamide and surfactant CMC 0.1% to make 10mg/ml solution finally sterilized by filtration using 0.45micrometer filters. The sterile discs (6mm in dia) were impregnated with 10µml of extraction (300µg/disc) at concentration of 30mg/ml and placed in inoculated agar.

Rifampicin at 100µg/ml is used as standard drug. The controls were prepared using the same solvents which was employed to dissolve the plant extract. The inoculated plates were incubated at 37°C for bacteria for 24 hr. the activity is given in table 3. An attempt has been made to compare the antibacterial activity of *Jatropha curcas Linn*, with the most potent standard was illustrated in fig 3.

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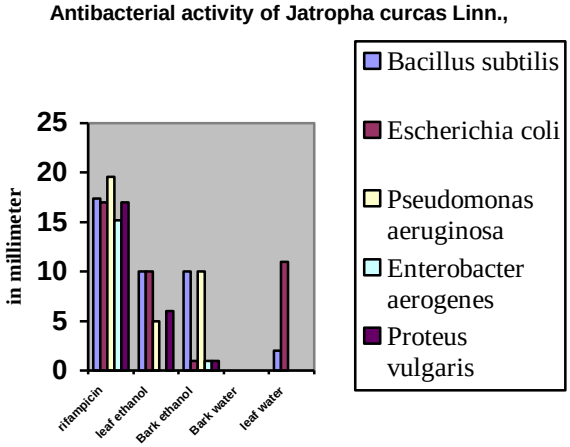
Table 3

Anti-bacterial activity of Jatropha curcas Linn,

Organism	Dose mg/ml	Treatment – zone of inhibition (in mm)					
		Control (distilled water)	Standard (rifampicin) 100µg/ml	Leaf ethanol extract	Bark ethanol extract	Bark water extract	Leaf water extract
Bacillus subtilis	10	-	17.4	10	10	-	2
Escherichia coli	10	-	17	10	1	-	11
Pseudomonas aeruginosa	10	-	19.6	5	10	-	-
Enterobacter aerogenes	10	-	15.2	-	1	-	-
Proteus vulgaris	10	-	17	6	1	-	-

Fig – 3



RESULTS AND DISCUSSION

Analgesic activity

Group V (Leaf ethanol extract) exhibited maximum analgesic activity at 120min and was found significant when compared with control group (P<0.001) but slightly less when compared with standard. From the study it was found, the plant extract possess good analgesic activity at dose of 300mg/kg (i.p) as compared to standard. Analgesics are classified into peripherally acting analgesic and centrally acting analgesic. Peripherally acting analgesics act by blocking the generation of impulses at chemoreceptor site of pain while the centrally acting not only raise the threshold of pain also after the physiological response to pain and suppress the patient's anxiety. Thus the leaf ethanol extract of *Jatropha curcas Linn.*, exhibited potent analgesic effect against thermal stimuli, which is evidenced by good analgesic activity at 300mg/kg dose as compared to control (P<0.001). This reveals that the extract act as peripheral analgesic.

Anti – inflammatory activity

The anti-inflammatory activity of ibuprofen and group V and group VI are summarized in Table 2. From these data it appears that all compound reduced paw edema in comparison to the control group at 1, 2, 4, 6 and 24 hrs post formalin injection significantly (P<0.01). The activity of extract III and IV were more potent than Ibuprofen (P<0.001).

Anti – bacterial activity

From the tabulated results it was found that leaf ethanol extract showed a significant response against Bacillus subtilis and E.coli and bark ethanol extract showed a satisfying activity against B.subtilis & Pseudomonas aeruginosa and leaf water extract showed a significant activity against E.coli. The anti – bacterial activity of the extracts was compared with standard rifampicin and was found effective but not as effective as standard drug.

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